Getting Better to Feel Better: How Gaming Affects Recovery and Vigor

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Abstract

The current study investigated the mediated relationship between playing video games after work and its effects on the recovery experiences of psychological detachment, relaxation, mastery experiences, and consequently their effects on vigor. Vigor was used as a well-being indicator as it shows an increase in energy, as opposed to fatigue which shows a decrease in energy. Employees (N=70) completed daily diary surveys over the course of two weeks. Aside from the study variables, the control variables included were the employees' daily number of hours worked, number of hours slept, and quality of sleep. Multi-level regressions analyses showed a significant mediated relationship between numbers of hours gamed and vigor via mastery experiences. Contrary to the hypotheses, psychological detachment and relaxation did not show a mediated relationship between gaming and vigor. The current findings highlight the unique pathways that different recovery experiences can enhance employees' well-being.

Introduction

Recovery - how to deal with daily built-up stress and strain from work - has become an important research topic in recent years (Bennett et al., 2018; Sonnentag et al., 2017; Steed et al., 2021). One aspect recovery research has been interested in is the activities individuals engage in after work. In recovery studies, activities are grouped in "low-duty" activities that may promote recovery (e.g., socializing with friends, watching TV, and physical exercise) and "high-duty" activities that may impair recovery (e.g., childcare duties; Sonnentag et al., 2017; Steed et al., 2021). More recently, the studied low-duty activities also include media related activities such as watching TV (Rieger et al., 2014; Rieger et al., 2015) or using a smartphone (Chen, 2018; Rieger et al., 2017). These studies have consistently shown a link between media use and recovery.

One media related activity that has not been researched as much as the previously mentioned activities is playing video games, or gaming in short. This is surprising, considering that according to the Entertainment Software Association (ESA; 2021) nearly 227 million Americans of all ages play video games. In addition, in the ESA survey 87% of respondents described gaming as providing stress relief and 66% of video game players stated they play to unwind and relax. While it may be tempting to conflate the results of other media use to gaming, it can be argued that gaming is a distinctly different activity from other forms of media. Gaming differs by being an inherently interactive experience; players need to

interact with virtually crafted worlds to progress. This interactivity provides new ways for recovery to occur when compared to other media, as has been described by Reinecke (2009a).

There have been few studies researching the relationship between gaming and recovery (Collins & Cox, 2014; Reinecke, 2009a; 2009b; Reinecke et al., 2011). These studies have found a mostly positive link between recovery experiences and gaming; however, most of these results have been based on between-group comparisons in an experimental setting. Moreover, research including proximal well-being outcomes such as vigor have been lacking. Therefore, this study attempts to extend current knowledge on the potential recovery effect of gaming using a daily questionnaire, with vigor as the key indicator of successful recovery. Vigor is the energy subjectively available to an individual during work and has been closely related to well-being and work performance indicators (Shirom, 2011). Within recovery research, fatigue is often chosen as the metric of successful recovery as it is closely related to stress and strain reactions (Danna & Griffin, 1999). While the relationship between fatigue and stress are unmistakable, Mäkikangas et al. (2014) explain fatigue and vigor as different affective dimensions which are not on opposite ends of the same spectrum. In other words, a decrease in fatigue does not mean an increase in energy. In short, vigor has been chosen as an indicator of successful recovery as it shows an increase in energy, instead of a decrease in lack of energy.

This study will investigate the mediating effect of the core recovery experiences of psychological detachment, relaxation, and mastery experiences between playing video games after work and feeling vigorous the next morning. This study contributes to the recovery literature by furthering research into gaming; an overlooked, yet potent recovery activity. This study attempts to extend current insight into gaming as a recovery activity by using a diary study. Adding a next day recovery outcome develops a better understanding of short-term recovery effects caused by gaming. Figure 1 shows an overview of the hypotheses tested, including the direct effect of the number of hours of playtime on vigor as part of the mediation analysis (Baron & Kenny, 1986).

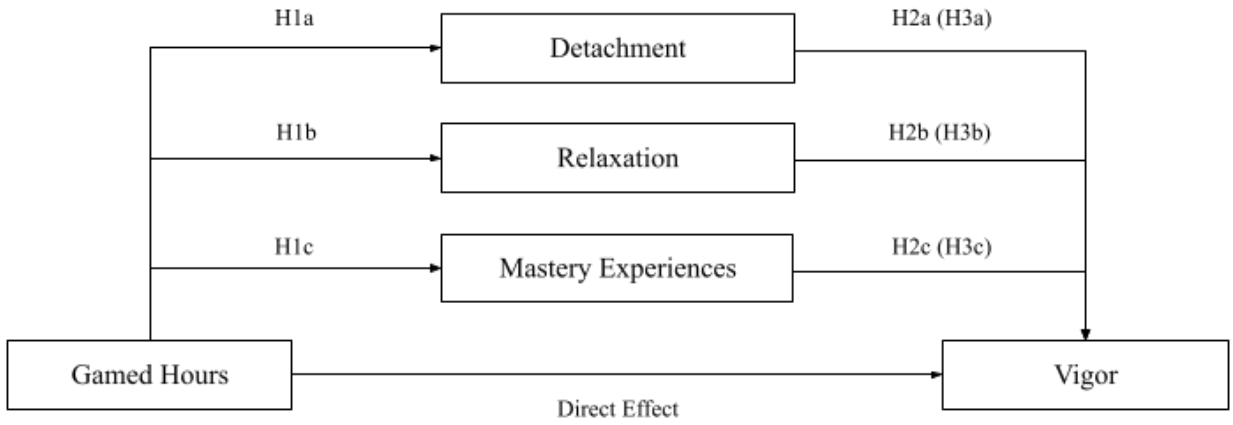

Figure 1. Conceptual mediation model. Measurements were done via daily surveys. All variables were measured in the evening, except for vigor which was measured in the morning. Hypotheses between brackets represent the indirect relationships. Direct effect was measured as part of the mediation analysis.

Overview on Recovery Research and Dimensions

The theoretical background of this thesis is based on two theories that demonstrate the recovery process. One of these theories is the Effort-Recovery Model (ERM; Meijman & Mulder, 1998). This theory postulates that work consists of daily demands that is dealt with by expending effort. This effort expenditure draws on the available resources and may lead to a depletion of resources (Meijman & Mulder, 1998). When this depletion occurs, stress is inflicted on the employee. In the best case, the ERM states that the depleted resources are regained during off-job time while engaging in a variety of activities. However, if the employee is unable to recover from their pent-up stress it can lead to negative load effects (e.g., fatigue). When stress is not dealt with or continues over a long period of time, the employee can experience severe negative consequences on their health and well-being (Maslach et al., 2001). In short, the ERM focuses on the effects of stress and strain on the individual and has a predominant focus on how employees' strain can go back to a pre-stress level.

While ERM takes a biophysiological position on recovery (Reinecke & Eden, 2017), another theory that is essential to the recovery literature is the Conservation of Resources (COR) Theory by Hobfoll (1989). This theory posits that people strive to obtain and retain resources that are important to them. When these resources are threatened or lost, stress is felt by the individual. Resources can be objects (e.g., a house), personal characteristics (e.g., self-confidence), conditions (e.g., a good career), or energies (e.g., time and money). The

mentioned resources are personal resources, while at work employees can additionally make use of available work resources like an understanding boss or social support from peers (Bakker & Demerouti, 2007). In short, COR theory is about how the (potential) loss of resources can be stress-inducing. Therefore, regaining lost resources and the acquisition of new resources can be beneficial to prevent long-term strain symptoms for the individual. ERM and COR theory give insight into the two different approaches recovery with which recvery can take place.

In the recovery literature, four core recovery experiences have been identified for recovery to occur: psychological detachment from work, relaxation, control, and mastery experiences (Sonnentag & Fritz, 2007; Sonnentag et al., 2010). Psychological detachment refers to the employee's experience of not engaging in job-related activities (e.g., finishing up a job, checking emails) and thereby not thinking job-related thoughts during off-job time. Relaxation refers to a psychological and physical state of low activation. Control refers to self-determination during off-job time. As many jobs do not give away a lot of control to the employee, gaining control during off-job time can be important to restore mood. Finally, mastery experiences refer to off-job experiences that are challenging or provide an opportunity for learning. This last core recovery experience especially highlights how recovery activities do not need to be relaxing or passive to induce feelings of recovery. Recovery can also occur by engaging in an immersive activity that broadens one's horizons and stretches one's boundaries. These four core experiences taken together form the basis of a measurement of recovery according to Sonnentag & Fritz (2007). When one or more of these experiences are felt, successful recovery should occur.

Prior Research on Gaming and Recovery

Reinecke (2009a) described how playing video games could fit into the definition of the core recovery experiences. According to Wirth et al. (2007) games evoke a high spatial presence as well as being an interactive form of media, making it likely that it will foster psychological detachment (Reinecke, 2009a). While games are frequently associated with psychophysiological arousal, gaming (akin to sports) almost contradictorily causes relaxation by decreasing state anxiety and tension (Thayer, Newman & McClain, 1994). Playing games inherently means having control over the whole situation as you control your player character. Lastly games are focused on giving the players a challenge against either other players or against the environment which could allude to mastery experiences.

To further illustrate this, Reinecke (2009b) tested the hypotheses of gaming eliciting feelings of recovery via each individual recovery experience. The conclusion was that gaming has a significant positive relationship to all four recovery facets. In another research by Collins and Cox (2014) the difference between gamers and non-gamers on their digital game use and recovery had been investigated. Their findings were that individuals that played games had a significant positive effect on the overall recovery experience on psychological detachment and relaxation compared to individuals that did not play any games. Yet, their findings did not show an effect for control and mastery experiences. However, in a study by Rieger et al. (2014) an argument was made how entertainment media could invite feelings of mastery when it involves certain challenges, like emotional hurdles with sad or poignant movies, or cognitive hurdles when there's a complex plot. Studies demonstrate that gaming has a positive relationship on the recovery experiences, however there is ambiguity regarding which experiences are affected.

The current study will investigate the relationship between hours played and its effect on recovery. The expected result will be that the number of hours spent on playing games is positively linked to the recovery experiences of psychological detachment, relaxation, and mastery. Due to the nature of a daily study, it was decided to use a short form of the Recovery Experience Questionnaire. Thus, this study will focus on psychological detachment, relaxation, and mastery. Control is left out of the questionnaire as a study by Chen (2018) found a non-significant relationship between control and playing mobile games. Chen explained that control does not seem to contribute to the recovery experience of players as it is already pervasive within gaming. The following hypotheses reflect these expectations:

H1a: The number of hours spent playing games is positively related to psychological detachment.

H1b: The number of hours spent playing games is positively related to relaxation.

H1c: The number of hours spent playing games is positively related to mastery experiences.

Recovery Experiences and Feelings of Vigor the Next Day

Vigor refers to a positive affective state that is characterised by high levels of energy, physical fitness, and cognitive liveliness experienced at work (Shirom et al., 2008; Shirom, 2011). Vigor has been used frequently as a well-being indicator as it is a predictor of prosocial organisational behaviors, physical and mental health, and job satisfaction (Shirom, 2011).

Vigor also represents the energy subjectively available, thus it can be an important indicator of having successfully recovered (Reinecke et al., 2011).

Through the lens of ERM, both psychological detachment and relaxation can foster energy by alleviating negative effects of stress (Reinecke & Eden, 2017). Psychological detachment mentally removes the individual from the workplace and so provides an opportunity to return to a previous state. This positive effect on stress mitigation has been demonstrated in several studies. A diary-based study has suggested that individuals that successfully detach from work experience less fatigue (Sonnentag & Bayer, 2005). Similarly, low psychological detachment in the evening is associated with higher levels of fatigue on the following day (Sonnentag et al., 2008). Relaxation on the other hand can decrease fatigue by reducing ruminative thoughts, alleviating stress-related arousal states, and returning to pre-stress levels of tension. According to Demerouti et al. (2009) relaxing can reduce allostatic load in the evening by reducing psychophysiological stress arousal. Accordingly, a within-person diary research done by Parker et al. (2019) shows that relaxation during the evening is positively related to next-morning energy ($b = .06$, $p = .042$). Thus, ERM shows a decrease in fatigue by returning to pre-stress levels which can provide opportunity to regain lost energy resources.

ERM focusses on returning to a pre-stress level, or in other words how additional energy resources can be provided. According to COR theory (Hobfoll, 1989; Hobfoll et al., 2018) engaging in activities that increase one's personal resource will also increase another resource. Activities involving mastery experiences typically challenge the individual without overburdening their capabilities. While it is not an effortless endeavour, completing the activity will help build up additional internal resources such as skills, competencies, and self-efficacy. In other words, engaging in activities involving mastery experiences increases an individuals' feeling of competence, which could result in additional resources, such as vigor (Sonnentag & Fritz, 2007). In line with this theory, a meta-analysis by Bennett et al. (2017) demonstrated a positive correlation between mastery experiences and vigor ($k = 5$, $\rho = .29$). Therefore, a similar positive relationship will be expected in the current study.

In short, it is expected that psychological detachment, relaxation, and mastery experiences are all positively related to next morning vigor. The following hypotheses reflect these expectations:

H2a: Feeling psychologically detached in the evening is positively related to next morning vigor.

H2b: Feeling relaxed in the evening is positively related to next morning vigor.

H2c: Gaining mastery experience in the evening is positively related to next morning vigor.

Indirect Link Gaming to Vigor via Recovery Experiences

To my knowledge no research has been done on the studied variables that includes recovery experiences as mediators to vigor as the dependent variable. However, there is one study that studies the direct relationships between these variables that we can draw upon. According to a study done by Reinecke et al. (2011) on how high versus low interactivity media on recovery experiences and antecedents could provide insight into the potential relationship. In this study, the potential relationship between entertainment media and recovery experience was explored. Energetic arousal and cognitive performance were taken as outcome variables. One hundred and sixty participants were randomly assigned to four experimental conditions: playing a video game (high interactivity), watching a video recording of the same video game (low interactivity), a short, animated video clip (low interactivity), and a control group (no interactivity). On arrival, participants were measured on their energetic arousal and were asked to complete a twenty-minute text manipulation task. Energetic arousal was tested again after task completion and after media exposure. Involvement, recovery experience, and cognitive performance were measured after media exposure or after a five-minute wait (control group). Their results illustrated a strong correlation ($\beta = .54, p < .001$) between high interactivity (video game condition) and involvement (the amount of awareness and attention is involved with a medium). In turn involvement was strongly correlated to the recovery experience ($\beta = .62$). Recovery experience was positively related to energetic arousal ($\beta = .27$) and cognitive performance ($\beta = .17$).

These results give insight in the individual, direct relationships between playing video games, recovery experience, and recovery outcomes. It also shows how the involvement of playing video games, in part due its high interactivity, could be beneficial for a successful recovery. This successful recovery could then provide enough resource gain to contribute to vigor. However, Reinecke et al. (2011) did not measure a potential mediated link between gaming, recovery experience, and vigor. Additionally, in their study recovery experience was used as a single outcome by adding up all the individual recovery experiences. Therefore, the current study will add onto Reinecke et al.'s research in two ways. First, the mediated link between gaming and vigor will be tested, using the recovery experiences as mediators. Second, the individual recovery experiences of psychological detachment, relaxation, and

mastery experiences will be used, providing insight into the potential effect of the individual recovery experiences. The following hypotheses are formulated:

H3a: Gaming in the evening is indirectly positively related to vigor in the morning, mediated by psychological detachment.
H3b: Gaming in the evening is indirectly positively related to vigor in the morning, mediated by relaxation.
H3c: Gaming in the evening is indirectly positively related to vigor in the morning, mediated by mastery experiences.

Method

Sample and Procedure

The current study will make use of data collected in 2016 – 2018 using a quantitative diary design. Participants were recruited by other students of the bachelor and master as well as myself as part of the thesis. Participants were selected when two criteria were met; if they had a stable job and regularly played console-based video games. The recruitment was done by a variety of ways; first, flyers were spread around in various Dutch, Greek, and German video game shops. Second, the websites Facebook (https://www.facebook.com/) and 9gag (https://9gag.com/) were used primarily for their social networks. Third, popular Dutch gaming magazine Power Unlimited (https://pu.nl/) and popular Dutch games news site Gamekings (https://www.gamekings.tv/) were used. Lastly, individuals were asked within the personal network of the project leader. This recruitment strategy culminated in a diverse and international sample.

Participants were asked to share their email address with the project leader, whereafter an invitation to participate in the study, an electronic informed consent form, and a general questionnaire were sent to them. Participants had to fill in the general questionnaire before the start of the diary study, which started on the next working day. After the general questionnaire had been filled in participants were sent two daily surveys in the morning and evening. These were sent out at fixed times (8:00 for the morning survey and 21:00 for the evening survey) for two consecutive weeks via the mobile data app MetricWire.

A total of 234 participants were invited in the study. Out of these, 165 completed the general questionnaire yielding a response rate of 71% for the general survey. Seventy-seven participants then started the first survey on the next working day. Seven participants were

excluded from the analyses, as they had not completed the daily surveys on at least one evening and the following morning, yielding a 9% dropout rate.

The final sample consisted of *N*=70 participants corresponding to a 39% response rate for usable daily surveys (based on the 165 completed general questionnaires). On average, they participated for 7.7 days in total (range 1 – 13 days) and were mostly male (83%) with a mean age of *M* = 25.31 years (*SD* = 6.79). Most participants played games more often than once per five days (68%) and the average play session per day was *M* = 1,70 hours (*SD* = 2,22). Due to the recruiting strategy the participants came from a wide range of professions, including accountant, barista, airplane cabin crew member, engineer, and researcher. Most respondents had a lower vocational degree (47%), followed by a bachelors' degree (32%), master or higher education (10%), and high school degree (6%). Seventy-three percent of participants had a fulltime contract (> 36 hours per week) with the majority having over a year of work experience (73%). On average they worked for *M* = 37.15 hours (*SD* = 12.83) a week.

Material

Time spent gaming. Time spent gaming was measured with a single item asking participants how many hours and minutes they had played video games in total during leisure time. Responses ranged from 0 (which meant they had not played any video games) to up to 12 hours. On average, participants spent *M* = 3.06 hours (*SD* = 1.53 hours) playing video games per evening.

Recovery. Recovery experience during leisure time was measured with the Recovery Experience Questionnaire (REQ; Sonnentag & Fritz, 2007). The REQ generally measures trait recovery, however for use as a daily survey the validity is still acceptable (Bakker et al., 2015). This questionnaire includes measures for psychological detachment and mastery experiences, both containing four items each. Items were changed to the past tense, as participants were required to fill in the questionnaires after leisure time. Items were scored on a 5-point Likert scale (1 = fully disagree to 5 = fully agree). Example items included were "This evening, during my off-job time, I forgot about work" and "This evening, during my off-job time, I got a break from the demands of work" for detachment. "This evening, during my off-job time, I learned new things" and "This evening, during my off-job time, I did something to broaden my horizons" for mastery experiences. The average Cronbach's alphas measured across days ranged between .77 and .84 (*M* = .70) for the detachment dimension,

between .63 and .89 (M = .77) for the relaxation dimensions and between .68 and .78 (M = .72) for the mastery dimension.

Vigor in the Morning. Vigor was measured in the morning with six items from the Shirom-Melamed Vigor Measurement (Shirom & Melamed, 2006). Items were answered on a 5-point Likert scale (1 = fully disagree to 5 = fully agree). Included subscales were physical strength and cognitive liveliness. Example items included "I feel physically able", "I feel energetic", and "I feel I can think rapidly". Cronbach's Alpha ranged from .86 to .95 (M = .90).

Control Variables. The control variables used were number of hours slept, sleep quality, and hours worked measured daily. Sleep is a well-researched recovery activity, where the amount of recovery an individual feels can be influenced by the amount and quality of sleep they experienced. On the other hand, working long hours is a well-researched job demand which could inhibit recovery mechanisms due to it becoming harder to detach from work (Sonnentag, 2018).

Analyses

Outliers were detected using Z-scores. The Mahalanobis distances were calculated and using a Chi Square distribution to calculate p-scores, observations were checked when $p < .001$. Then, assumptions for linearity, normality of errors, multicollinearity, and homoscedasticity were checked. Five observations had a Mahalanobis distance with $p < .001$. To check if these were significant for the data the assumptions were checked twice, once including these five outliers, and once omitting them. There was no significant change in the assumptions, thus these outliers were included in the final dataset.

To check if the data was of a multi-level structure an empty model was tested and the same model including the random intercept. The empty model resulted in a log likelihood of $-2\log(_{2\ df}) = 366.701$. This decreased to $-2\log(_{3\ df}) = 340.810$ in the random intercept model. This significant decrease in model fit shows that days that were nested within the same participant were more similar than days across all participants, thus confirming a multilevel data structure.

The data was analysed using multilevel, hierarchical linear regression analyses in SPSS version 25. Shared variance was expected within the daily questionnaires associated with the same participant, as was shown in the nested structure of the data. Multilevel regression allows for testing relationships that consider the shared nature of the days within

individuals. To test the mediation an add-on for SPSS was used called MLMED (Hayes & Rockwood, 2020) using the maximum likelihood method of analysis.

Results

Table 1 shows the means, standard deviations, and correlation coefficients of the studied variables and the control variables. The correlations mainly show positive relationships between the number of hours gamed and mastery experiences, however similar relationships were expected for detachment and relaxation which did not emerge. In line with the hypothesis, vigor showed positive relationships with gamed hours, relaxation, and mastery. Detachment did not emerge as having a positive relationship with any of the study variables, contrary to the hypotheses. Work hours, sleep hours, and sleep quality also showed significant relationships with the study variables.

Table 1.

Means, standard deviations, and correlation coefficients of studied variables including the covariates (work hours, sleep hours, and sleep quality). Top half of the diagonal represents the correlations at the mean-level (N = 70 participants), bottom half of the matrix represents the correlations at the day-level.

	N	*M*	*SD*	1	2	3	4	5	6	7	8
1. Work Hours	330	6.04	5.46	-	.05	- .15	- .08	-.30*	- .17	.08	.12
2. Sleep Hours	222	6.86	1.57	-.23**	-	.18	-.28*	.01	.22	.31*	.25*
3. Sleep Quality	278	3.31	0.63	- .1	.40**	-	.31*	.08	.1	.25*	.43**
4. Gamed Hours	310	1.69	2.22	-.13*	- .13	.08	-	.22	.15	.36**	.08
5. Detachment	372	3.43	0.87	-.23**	.13	,14*	.26**	-	.56**	.12	- .18
6. Relaxation	372	3.87	0.72	-.17**	.23**	,18**	.14*	.44**	-	.38**	.04
7. Mastery	372	3.32	0.83	- .04	.16*	,17**	.40**	.17**	.29**	-	.37**
8. Vigor	278	3.63	0.69	- .05	.31**	,43**	.15*	.09	.25**	.33**	-

*$p < .05$. **$p < .01$.

Table 2 shows the within-person fixed effects of the multilevel hierarchical and mediated regression analyses. Hypothesis 1 investigated the potential relationships between playing games and (a) detachment, (b) relaxation, and (c) mastery experiences while controlling for number of hours worked, slept, and quality of sleep. The results showed significant relationships between the number of hours gamed and relaxation ($\beta = .09$, $p < .01$), and mastery experiences ($\beta = .16$, $p < .001$). No significant relationship was found for detachment ($\beta = .07$, $p = .06$), therefore, Hypotheses 1b and 1c are supported and 1a was not supported. This means that on days where employees engaged more hours in video gaming in the evening, they experienced more detachment, relaxation, and mastery compared to days they did not engage with video games.

Table 2.

Results of Within-Person Fixed Effects with MLMED (*N* = 70 employees with *k* = 372 days filled in).

	Detachment as dependant var		Relaxation as dependant var		Mastery as dependant var		Vigor as dependant var	
	B	SE	B	SE	B	SE	B	SE
Work Hours	-.05**	0.02	-.02	0.01	-.02	0.02	0.01	0.01
Sleep Hours	-0.003	0.06	-.01	0.05	-.001	0.05	0.05	0.04
Sleep Quality	0.13	0.16	0.39**	0.13	0.40**	0.15	0.37**	0.12
Gamed Hours	0.07	0.04	0.09**	0.03	.16***	0.03	0.04	0.03
Detachment							-.02	0.07
Relaxation							0.01	0.09
Mastery							0.17*	0.07
Vigor x Detachment							-.002	.01
Vigor x Relaxation							.001	.01
Vigor x Mastery							.03*	.01

p < .05; ** p < .01; *** p < .001.

Hypothesis 2 investigated the potential relationships between (a) detachment, (b) relaxation, and (c) mastery experiences to vigor the next day while controlling for number of hours worked, slept, and quality of sleep. The results showed no significant relationships for both detachment (β = -.02, p = .73) and relaxation (β = .01, p = .90), however mastery experiences related positively to vigor (β = .17, p < .05). Therefore, Hypotheses 2a and 2b are not supported, Hypothesis 2c is supported. This means that on days where employees experienced feelings of mastery, they felt more vigorous the next morning, controlled for their number of hours worked that day, number of hours slept, and the quality of sleep.

Hypothesis 3 investigated the indirect relationship between hours spent playing games via (a) detachment, (b) relaxation, and (c) mastery experiences to vigor the next day while controlling for number of hours worked, slept, and quality of sleep. The results from MLMED showed significant indirect relationships between numbers of hours gamed and vigor via mastery experiences (β = .03, p < .05). Detachment and relaxation, however, showed no significant indirect relationship (β = -.002, p = .77 and β = .001, p = .90 respectively). In addition, the results also showed a non-significant direct relationship between numbers of hours gamed and vigor (β = .04, p = .12) showing a complete mediation through mastery experiences (Baron & Kenny, 1986). Therefore, Hypothesis 3c was supported, Hypotheses 3a and 3b were not supported. Employees experienced stronger feelings of mastery on days where they engaged with games in the evening, which led to the subjects reporting having more vigor the next morning. This data was controlled for the number of hours that they

worked that day, number of hours slept, and the quality of sleep. Figure 2 shows the beta coefficients for the within-person fixed effects for the relationships included in the model.

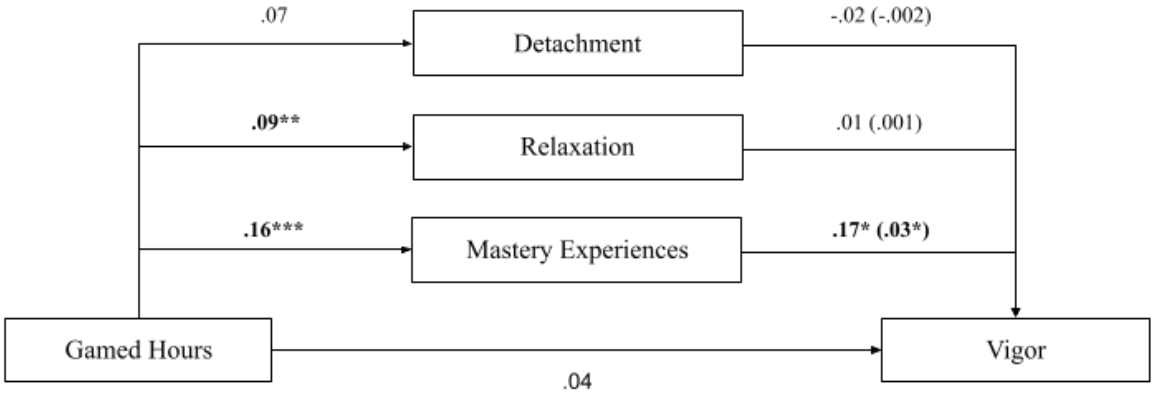

Figure 2. Full within-person fixed effects model with beta coefficients shown. Beta coefficients between brackets represent the indirect effect of the mediator of gamed hours on vigor.

Discussion

The current study investigated the relationship between playing video games after work and how it can affect recovery in employees' daily life. These relationships were also controlled for by common variables linked to recovery and wellbeing, these being work hours, sleep hours, and sleep quality. Hypothesis 1 investigated the direct effect of playing video games on the recovery experiences psychological detachment (a), relaxation (b), and mastery (c). Hypothesis 2 investigated the direct individual effects of these recovery experiences on vigor. Lastly, Hypothesis 3 investigated the mediated relationship of playing games on vigor via the individual recovery experiences.

The results showed partial support for Hypothesis 1; playing video games was positively related to relaxation and mastery. However, this relationship was not shown for detachment. These results only partially supported the hypotheses as they expected gaming to affect all recovery experiences in line with the study done by Reinecke (2009a). Hypothesis 2 was also partially supported; only mastery experiences were significantly related to vigor. Detachment and relaxation did not relate significantly to vigor. Lastly, the results showed partial support for Hypothesis 3, with the only significant mediated relationship between playing video games and vigor being via mastery experiences. The difference in our findings compared to previous results could be attributed to the fact that previous recovery research has mostly focussed on fatigue as the main recovery outcome variable and less so on vigor. This is also stated in the meta-analysis done by Bennett et al. (2018). Their results indicate

that research on detachment and relaxation is more commonly associated with fatigue as the main recovery outcome variable and less so with vigor. Their meta-analysis also shows the stronger effect of both detachment and relaxation on fatigue ($\underline{r}$ = -.34 and $\underline{r}$ = -.30 respectively) than on vigor ($\underline{r}$ = .14 and $\underline{r}$ = .24 respectively). This explanation is also in line with ERM (Meijman & Mulder, 1998), as psychological detachment and relaxation are relevant recovery experiences to regain post-stress energy levels. Within this framework, alleviating fatigue (which is most effectively done by engaging in detachment and relaxation activities) is equivalent to a return to post-stress energy levels. This would explain how neither detachment nor relaxation showed significant effects in the current study; these experiences are more effective at returning to previous energy levels, but are not as effective at increasing energy levels. This increase in energy levels is more so in line with COR theory (Hobfoll, 1989) which states that an increase in energy (resources) can be gained via other resources, such as an increase in self-efficacy through mastery experiences. Again, the meta-analysis by Bennett et al. (2018) shows a stronger effect of mastery on vigor ($\underline{r}$ = .25) than on fatigue ($\underline{r}$ = -.15). These findings combined show the distinctive pathways through which the individual recovery experiences affect well-being outcomes such as fatigue and vigor.

Another explanation for why psychological detachment in particular did not show a significant effect could be due to the current study not taking job demands and the consequent need for recovery into account. These demands can consist of stressors such as a heavy workload, physically taxing labour, interpersonal conflicts, and cognitively taxing work that requires mental effort and concentration (ten Brummelhuis & Bakker, 2012). What demands the employee faces and their severity can differ per day, and these can have a large effect on the subsequent recovery experience of the employee. It is also known that when an employee faces more demands and is therefore more in need of recovery, detachment paradoxically becomes harder to achieve (Sonnentag, 2018). Thus, it could be that the employees included in the study had a harder time detaching from work due to their recovery needs being high.

The current study shows significant additions to the current literature in several ways. First, the current study uses a daily measure of gaming, recovery, and vigor as the main method of observation. This allowed for more accurate insights into the gaming habits in comparison to studies where individuals must estimate how much time they spend on games on average. Through this method the effect of gaming on recovery and consequently its antecedent could be investigated more directly. The main result of this research also shows the effects of COR theory concerning gaming. This result indicates that individuals that

experience mastery through gaming have achieved a sense of self-efficacy and therefore gained more personal resources, thus allowing them to engage with the job-related demands with more resources at their side. While this result is interesting, future research could examine the effect of motivation and player type on this result. Kaye and Bryce (2012) argued that motivations, contexts, and experiences are vital for the outcomes that are gained after playing games. This is echoed by Yee (2001) who made a typology of the different types of gamers according to their internal motivations to play. According to his typology, one group of gamers, called achievers, are motivated by being the best and working hard to achieve certain goals within the game. It could be worthwhile to investigate the different types of gamers and their motivations to play within the context of recovery.

Second, this research extends the current literature of recovery antecedents by adding in a daily measure of vigor. Though an important measure of energy gained from successful recovery, it is still more common to include fatigue as a measure of successful recovery. Although, as Mäkingas et al. (2014) have described, fatigue and vigor are not at the opposite end of the same affective dimension. Current results show the added advantage experiencing mastery has on vigor, even when controlled for variables which have been known to increase vigor like sleep quality.

Lastly, this research shows the significance of adding most, if not all, recovery experiences to recovery studies, especially those related to media usage. Most recovery research has focused their attention on detachment as the main recovery pathway, however according to the ERM and COR theory there seem to be different pathways through which recovery can take place. This is in line with the conclusion of Bennett et al. (2018) in which they propose that each recovery experience has their own unique disposition to achieve recovery.

Limitations

While care was taken to recruit a diverse and representative sample through the different channels used, it is likely that self-selection took place in the recruitment of participants. For one, the current sample has been mostly obtained hrough video gaming websites and video game-related stores. These could be mostly frequented by people that identify as so-called gamers, while other individuals that also play games but do not identify through this label might be unintentionally excluded. This could have resulted in the high percentage of men included in the study, even though data shows that the population of people that plays games

is about evenly split between men and women. Future research should take care in allowing both men and women to be represented.

One unique aspect of gaming is the fact that it can be enjoyed with multiple people through online worlds and multi-player systems. Due to the scope of the current study, these aspects were not included, however, there might be good reasons to explore these aspects and their effects on individuals. A study by Kaye et al., 2018 studied the effects of context (i.e., playing alone, with online strangers, or with friends) on mood which showed that playing games with friends relates to positive affect. Combining this result with This result including typology research done by Yee (2006) on the different motivations individuals have for playing games could show interesting results for recovery and wellbeing.

A last limitation was that the current study did not include an exhaustion or need for recovery measure after work. Measuring this could put more context to the current results, as was discussed before with the paradox in detachment. Another factor it could have added is the amount of leisure crafting employees engage in after particularly strenuous days (Petrou & Bakker, 2016). It would be interesting to investigate what leisure time activities employees engage in when tensions get high. It could be that they would engage in activities that more directly engage in detachment and relaxation experiences, such as to regain a pre-stress level of energy as has been described in ERM (Meijman & Mulder, 1998). Future research should investigate the needs employees have after work, to understand why they may or may not engage in gaming for their recovery needs.

In sum, this study explored the effects of playing video games and showed a positive effect of post-work video game play on recovery and vigor. These findings demonstrate the importance of engaging in activities that not only engage with experiences of psychological detachment, but also in other recovery experiences. This study also highlights the role of mastery experiences gained from gaming resulting in a greater amount of energy felt the next day. Employees could therefore during their gaming activities consider what they are trying to achieve when they are playing. This feeling of progression and achievement can fuel their sense of mastery. Lastly, organisations could explore adding gaming or gamified elements into the work environment to investigate if this could also introduce feelings of mastery during work.

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